THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER AND ELECTRO-PLATERS REVIEW.

A TRADE JOURNAL RELATING TO THE NON-FERROUS METALS AND ALLOYS.

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OXYGEN IN COPPER TIN ALLOYS.

In explanation of the well-known fact that copper tin alloys after each remelting become more and more thickly fluid, it has hitherto been held that this phenomenon was caused by the oxidation of the copper by the oxygen of the air and the consequent formation of cuprous oxide in the molten mass. Recent experiments however, undertaken by Prof. Heyn and Bauer, of the German Government Testing Station at Charlottenburg, Germany, point to the fact that it is not the copper but the tin which combines with the oxygen, with the formation of stannic acid. It is claimed that copper oxide cannot exist side by side with metallic tin, as it is reduced by the latter at the melting temperature of the copper tin alloy.

The stannic acid thus formed has been found by the above investigators to be insoluble in the melted alloy and to remain suspended in it either in the form of bluish-grey crystals or of thin pellicles. The former by crystallizing out between and the latter by enveloping particles of the alloy affect deleteriously the homogeneousness of its structure. The stannic acid is always found in that part of the alloy which solidifies last and it causes the alloy to flow thickly.

Experiments undertaken with a view to find out a method of reducing the stannic acid showed that it is not sufficient to melt the copper-tin alloy under a layer of charcoal. The latter can only exert its reducing influence upon such particles of stannic acid as rise to the top of the melt. These particles, however, have a tendency to float in the molten alloy and thus they do not come into contact with the charcoal and remain unacted upon. Phosphorus, on the other hand, was found to accomplish the reduction of the stannic acid without much difficulty, inasmuch as it dissolves in the alloy and thus has a chance to reach all its parts and to exert its action upon them.

This matter furnishes another illustration of a well-known fact, namely, that the chemical analysis of an alloy, that is the mere determination of the percentage in which the various constituents are present, is unable to account for all variations in its mechanical or other properties. Though varying quantities of metallic tin and stannic acid might be present in an alloy of the above description, this fact would obviously not be detected by merely determining the total

percentage of tin in the alloy, and the variations in the properties brought about by such varying quantities would remain unexplained. There is evidently still a vast field open for methods of examination, including both microscopic investigation and chemical analysis.

In connection with the copper tin alloys, it is claimed by the above investigators that the gray and yellow spots frequently seen on the fracture of bronzes are not due to segregation of an alloy differently constituted from the rest of the bronze, but that they are simply due to the formation of larger crystals, due to the slow cooling of the bronze. When the cooling takes place rapidly the alloy will show a fracture of an even mixture of color. If the gray spots are bored out and subjected to chemical analysis, they show the same percentage of tin as the yellow ones. The mechanical properties, of course, suffer, when the crystals are large.

THE WORLD'S SUPPLY OF TIN.

Statistics for the year 1903 show a consumption of tin in the United States of 83,133,847 pounds, as compared with 85,043,353 pounds in 1902. As there was no tin produced in this country from domestic ores, though quite a considerable quantity is obtained by the various establishments which recover the tin from tin scrap, virtually the bulk of the metal used in the arts was imported. The consumption of tin in the United States was 43 per cent. of the world's supply, while that of Great Britain was 28 per cent. The European countries consumed 22 per cent. and 7 per cent. were consumed by India and China. The chief producers of tin are the Malay States, and the Dutch East Indies. The outlook as far as the production of the metal is concerned, is that the Malay States will not increase their output very much, the estimated increase being about 1,000 tons. The Dutch East Indies, on the other hand, are falling considerably behind. In fact, it has been stated that the Banca deposits, which have been worked for so many years, are on the decline, and the prediction has been made that if no new deposits are found the Dutch East Indies will cease to rank as a producer of tin within less than the next twenty-five years. Bolivia has been increasing her output steadily, and she now furnishes about one-tenth of the world's supply. Her output is also estimated to increase at the rate of about 1,000 tons. The production of Cornwall has remained practically the same for the last few years and her output will not affect the situation materially. The deposits reported from the northern part of the Malay peninsula, from Siam, Burmah, South Africa and Alaska may show up well, but can hardly be expected to exert such an immediate influence on the production.

Taken altogether, and allowing for a certain increase in consumption, the total production of tin is therefore likely to fall somewhat behind the demand, and it is probably safe to predict that the price of tin will not decline to any large extent for some time to come.

CHEAP CHEMICALS FROM THE PLATER'S STANDPOINT.

It is frequently found that when formulae for plating solutions that have been giving satisfactory results at certain places are reproduced elsewhere the results fail to come up to expectations. This may, of course, be due to a variety of causes, not the least among them the unfamiliarity of the person working with the solution with the precise conditions of operation to the best advantage, a knowledge of which has to be gained by experience.

One of the causes of unsatisfactory results, however, which is often overlooked but which is none the less at the bottom of a good deal of trouble, is the variation in the purity of the chemicals used at different places. In this day of keen competition manufacturers of chemicals, as well as those in other lines of business, are forced to produce as cheaply as possible, and in many instances it is the quality of the product which suffers thereby, especially as it is very often impossible to detect the presence of foreign substances in chemicals without a chemical analysis. Such products may, and probably will, do for people in other lines of business, but they certainly will not do for the plater, inasmuch as the impurities introduce needless complications in the chemical processes going on in the plating bath. They thus render a process which is already as such difficult enough, still more so.

Chemicals are the most important requisite in the plater's business, and care should be used to procure as pure products as can be obtained in the commercial grades, even though the price asked for them be higher than that of the cheap articles. True economy is not to be obtained in a plating establishment by the purchase of cheap chemicals, as many a plater has found out to his sorrow.

THE BLACK NICKEL FINISH.

The process of black nickeling will unquestionably find increasing application among platers, as the popularity of the black finish and the demand for it on the part of the public are increasing. The subject is therefore of considerable interest at the present time. It has been customary, as described in an answer to an inquiry in the December, 1904, issue of THE METAL INDUSTRY, to make up solutions for the black nickeling bath in which the addition of arsenic plays a prominent part. It is, however, more or less difficult to incorporate the arsenic in the solution, and the handling of the latter demands a good deal of care and experience in order to get satisfactory results.

At another place in this issue there will be found an article by Mr. C. H. Proctor, which contains a description of his method of preparing and running a black nickel solution, which is easily rigged up and gives very satisfactory results. As it depends only upon the introduction of potassium sulphocyanide, it is free from the complications introduced by the presence of arsenic, copper salts, etc., in solutions used heretofore. On account of its simplicity and the beautiful color of the deposit obtained it will undoubtedly recommend itself to the plater.

CASTING BRONZE BY THE CIRE PERDUE OR "LOST WAX" PROCESS.

By W. N. Nelly.

The Cire perdue or Lost Wax process was known many centuries ago to the Japanese and later to the Greeks and the Romans. Proof of this fact is furnished by specimens in the museums. Necessary particulars, however, about the materials used by the ancients and their method of carrying out the process of molding and casting are entirely lacking.

Nevertheless one thing appears to be proved, namely, that the idea underlying their process of casting is one and the same as that of Benvenuto Cellini in Italy, who lived from 1500 to 1571. Details as to his methods are also not available, little being known besides that, after making his patterns in wax, he would cover them with some kind of clay. This clay he then dried by means of fire, so as to melt the wax out and thus secure an impression of his work, into sand rammed around the whole impression, set in a sort of iron box made of several flasks on top of each other and clamped together, deep enough to hold the pattern, gates, etc. The whole flask was then put in an oven when the sand could dry and the wax melt out of the mold, after which operation the mold was ready to be cast. The results were surprising, considering the smoothness and sharpness of the castings, which were without a fin to mar the beauty of the object, no matter how full of undercuts it was. This process was however, too long and expensive and fell almost entirely into disuse.

About fifty years ago Mr. Allessandro Nelli, of Rome, discovered a method which allowed him to do away with the sand painting of the wax pattern and established a quick process by which from a plaster

BRONZE GROUP. CAST BY THE CIRE PERDUE PROCESS.

which he could run his metal. As Cellini was a sculptor as well as a foundryman and one of the finest chasers, he would model his statue or bust, etc., in clay leaving the dimensions ¼ inch smaller than the casting was intended to be. This first rough model served as his core. Over this he would lay his wax about ¼ inch thick, and would then work this wax so as to suit his taste, making it ready for the cast.

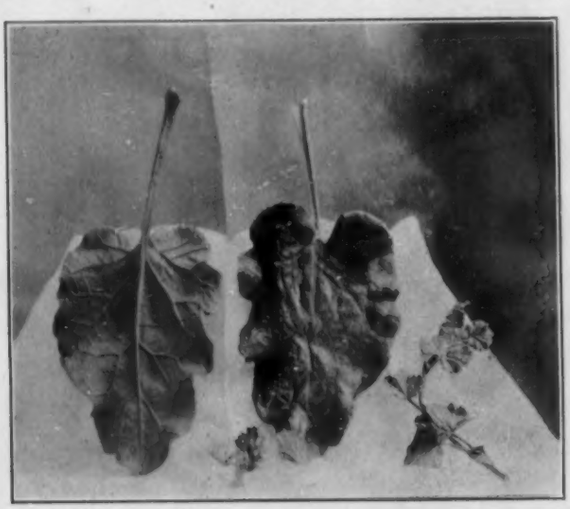
After Cellini died this art, which, while he was alive, marked a period of awakening in the history of the fine art bronzes, was doomed to be abandoned, the dry sand molding process being used for false core molding work for works of art. Some European foundries made wax patterns over a core made of common molding sand, vented it in different ways, made it solid with irons, etc., and then painted the surface of the work with a mixture of finest molding sand and water by means of a camel's hair brush. One coat was put on every day and left to dry for the rest of the day. This was repeated until a thickness of nearly ½ inch was reached. The gates were then cut and the cast or any other pattern a perfect reproduction could be made in a short time. This process resulted in castings having a good, smooth surface and did away with fins and shoot-byes, which are almost impossible to avoid in the dry-sand, false core molding process. Mr. Nelli, in less than half a century, raised himself from very moderate circumstances to considerable wealth by doing all kinds of small and large "Lost Wax" casting statuary work for all over Europe and North and South America. He so increased the work that when he died, a little over a year ago, he left a plant which is to be classed as one of the largest artistic bronze foundries in the world and is a monument to his skill and success.

This process is now beginning to spread. From the artistic point of view it is above any other, and the artists appreciate its merits and indorse it. It is my opinion that every foundry doing fine artistic work would save time and labor by having some of the castings done by this process. The process does not apply, of course, to all kinds of work, but only to some special

branches of very difficult work where a great deal of care is required in molding and where core molding is difficult and in some cases impossible. Then the advantages of the process are shown plainly when it is considered that false cores are done away with altogether.

In the following some particulars are given relative to the carrying out of the process. Supposing the sculptor to have finished a model of a grazing horse, the whole model to be about 2 feet long and 1 foot 6 inches high. After he has put the finishing touches to the plaster cast, he turns it over to the foundryman, who first of all makes an impression of the horse and the base on which it stands, either a plaster or a glue mold being made. The next operation consists in casting a wax model from this mold. This operation is performed by pouring molten wax into the mold and pouring it out after a few seconds, allowing it just time enough to form a wax deposit around the inside of the mold. The thickness of the deposit is dependent upon the size of the work.

The mold is then opened and the hollow wax model taken out. The sculptor can now go over it and put



BRONZE LEAVES. CAST BY THE CIRE PERDUE PROCESS.

on the finishing touches and make any changes in it he thinks advisable. In the case of the grazing horse he might, f. i., want to put a harness or a coil of rope on it, so as to convey the idea that it had just been left by the rider. This he can easily do by modeling them out of the same wax and setting them on as desired.

After the sculptor is through retouching and changing his work, the molder puts the sprue gates and the vent gates on the model. These are pieces of wax rolled in the shape of rods of different sizes. He then sticks in a few pieces of wire which are intended to hold the core in place. After this is done he makes the final mold for the metal by pouring a liquid mixture of brick dust of a special kind mixed with other ingredients, plaster among them, around the wax figure. This composition hardens very soon after its application. What is left to do now is the core, and this is readily made by filling the hollow wax model with the same mixture as above, from some hole left for the purpose, in the case described from the horse's legs. The model is left for a while to harden or set and is then put into the oven, gates downward, so as to allow the wax to run out. A fire is kept burning continuously for a certain length of time until the mold is baked.

The last operation is the pouring of the mold, which is done after banking the mold in the ground in order to prevent the weight of the metal to burst the mold open when it is filled. After the mold has cooled off it is dug out of the ground and what is left of it is ground down and stored for future use.

HIGH TEMPERATURE MEASUREMENTS.

Referring to the melting points of the metals, which were given in THE METAL INDUSTRY, Vol. III., page 11, it is of interest to give the most recent data as determined for some of them by the United States Geological Survey in conjunction with the German Government Office for Testing Materials. The determinations gave the following results.

Metal.	German Office. Centigrade.	U. S. Survey. Centigrade.	Difference. Centigrade.
Cadmium	321.7°	321.7°	0.0°
Zinc	419.0°	420.0°	1.0°
Silver	961.5°	962.2°	0.7°
Copper (in air)	1064.9°	1065.3°	0.4°
Copper (in reducing atmosphere)	1084.1°	1083.6°	0.5°

The table is interesting as furnishing an idea with what accuracy high temperature measurements can now be performed by means of the very sensitive pyrometers obtainable at the present day, and the determinations are probably the most accurate ever made.

THERMIT EXHIBIT IN NATIONAL MUSEUM.

The Goldschmidt Thermit Company, of New York, received a Grand Prize at the St. Louis Exposition, and now the United States has requested them to present the National Museum at Washington with their entire exhibit at the World's Fair. The collection consists of large pieces of pure, rare metals and alloys, free from carbon, such as chromium, manganese, molybdenum, ferro-vanadium, ferro-titanium and others. Also diagrams and models showing the numerous applications of the process of utilizing the heat of thermit, and numerous pieces—in particular, welded girder rails—showing the very successful operatons by this process in joining and fusing iron and steel, including models and specimens of the appliances used.

The Goldschmidt Thermit Company parted from this collection with considerable regret, but the thought that the embodiment of the progress made in a few years in the alumino-thermic science would find a permanent home in the National Museum of the United States caused them to make the sacrifice.

PRODUCTION OF GOLD IN 1903.

According to the statistics recently published by the United States Geological Survey, the production of gold in the United States during the year 1903 was 3,560,000 fine ounces, valued at $73,591,700, a decrease of $6,408,300, or 8.01 per cent as compared with 1902. The greatest decrease in production was in Colorado, where the production fell off $5,928,600, or 20.82 per cent. Decreases were also apparent in Oregon, New Mexico, South Dakota, Georgia, Wyoming, South Carolina, North Carolina and Maryland, while Nevada, Alaska, Arizona, Utah, Idaho, Montana, Virginia, Washington and Alabama showed an increase, and Kansas and Tennessee reported for the first time.

BLACK NICKEL PLATE OR GUN METAL FIN ISH AND ITS PRODUCTION.

By Charles H. Proctor.

Some years ago there was an unusual demand for metal goods finished in antique brass. This beautiful finish was applied to various classes of metal goods, such as lamps, clocks, cabinet hardware, ornamental figures and many other kinds of goods. It was usually produced on ornamental surfaces having recesses to hold the black background, and was produced in various ways by such agents as common shoe paste, lampblack mixed with varnish lacquer, the ammonia copper solution and by so-called black nickel plating. The latter procedure gave the best results.

The coming year will, no doubt, bring an unusual demand for this kind of finish, as the bright finishes seem to be losing their hold in the market—French gray, oxidized silver and antique and dull brass seem to be taking their place. Antique brass produces a very rich effect; its soft yellow and black surface does not seem out of place in any surroundings. Perhaps the most widely known solution for producing a black coating on brass is the ammonia copper solution. This is an immersion solution and is usually used hot, but gives a good deal of trouble on account of its variation, although with care very good effects may be produced on brass-plated goods. It is perhaps the only solution that will produce a black coating on brass by simple immersion. Copper nitrate or sulphate give brownish to black effects and are useful where brownish backgrounds are desired. The old bath for electro-depositing so-called black nickel was usually made up by dissolving 12 ounces nickel salt to each gallon of water, neutralizing with ammonia water and using sufficient cyanide of potash to give a clear solution. White arsenic was then dissolved in a hot saturated solution of cyanide of potash and a sufficient amount of this solution was added to the cyanide of nickel solution to give the desired results. Anodes of wrought iron or nickel were used. This bath needed a very powerful current of at least six volts pressure and often became very troublesome in its action.

A solution which will give a deposit in two minutes or less that is satisfactory for all antique finishes and which will give in four or five minutes a beautiful black deposit that can be polished if necessary in the same manner as nickel-plated goods, that is dense and hard and has good wearing qualities, is made up as follows: Eight ounces of nickel salts and three ounces of ammonium sulphate are used for each gallon of water. After the desired amount of solution is made up, it is tested with blue litmus paper and if it is found acid, ammonia is added in small quantities until the acid is neutralized. Two ounces of sulphocyanide of potash are then taken to each gallon of water used, dissolved in as small an amount of hot water as possible and added to the nickel solution. The latter is rigged up exactly as a nickel solution, using nickel anodes, with about the same current strength for deposit. Where a solution is made new, it is advisable to work it for a while before adding the sulphocyanide by hanging a few anodes on the work pole. This gives the bath the proper action and enables the plater to know just how the bath is working before he changes it to the black nickel solution.

This bath gives good results from the start, producing a beautiful black deposit on polished surfaces and a dark steel finish on dead surfaces. It can also be used to produce brown effects by regulation of the current, which can be done in a few seconds. This produces a rich finish when scoured by hand with the aid of powdered pumice stone and afterward lacquered with a lacquer containing aniline Nile green, thus changing the brown into dark olive green and the brass surface to a slightly green tint. Where it is required to make up a ten- or twenty-gallon solution for immediate use and where there are several nickel baths in use in the plating room, a sufficient quantity of solution to give the desired amount is taken from each bath, neutralized as described above and the sulphocyanide of potash added.

The solution can be replenished when necessary by adding nickel salts and a small amount of sulphocyanide. If it is found that the deposit comes out dullish when a new solution is made, it is an indication that too much ammonia was used in the process of neutralization. In that case it is best to add a small amount of sulphuric acid in water to neutralize the excess of ammonia, which procedure will usually bring the bright color back again. If it is found that the bath does not conduct freely inside of hollow goods one or two ounces of sodium bisulphite may be added to each ten gallons of solution used.

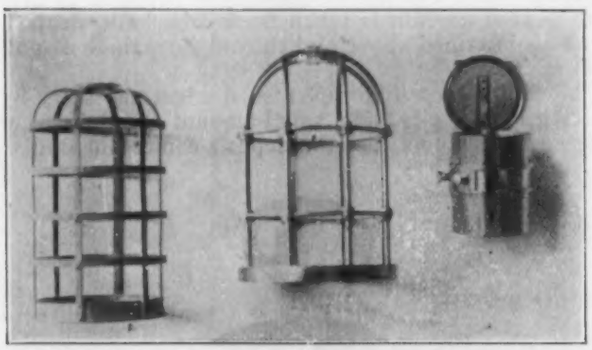
WATCH CASE WITH GUN METAL FINISH.

Articles for black nickeling are polished and cleaned in the usual manner as for nickel plating and treated as such. For antique work, after black nickeling, the goods are relieved on the relief parts by a medium hard rag wheel using hard nickel rouge, after which they are cleaned and lacquered. They may also be relieved on a soft buff in cases where a more dead effect is desired. In such cases powdered pumice stone mixed with flour and water is used and the wheel is kept moist by water dropping upon its surface. The operation may also be carried out by hand with the aid of a rag and pumice stone.

The solution may also be used on copper or copper-plated surfaces to give antique copper, or on silver or silver-plate to give antique silver; it produces a very

good effect and saves the use of oxidizing solutions. When goods are to be left with the natural black nickel surface, they may be slightly polished on a canton flannel wheel, using powdered crocus and wood alcohol or lampblack mixed with kerosene. They are then washed and lacquered with a heavy body lacquer.

Many pleasing effects may be produced on plain surfaces, such as brass tubes, spun shells or other flat surfaces by cutting out different designs by the aid of electrician's black insulating tape. These designs are applied to the black nickeled surface and the exposed surfaces are then polished in order to remove the black coating. The tape is then removed and the articles are slightly washed with benzine and lacquered. This procedure gives black figures on a brass surface. By



LAMP GUARDS FOR THE U. S. NAVY. FINISHED IN BLACK NICKEL.

using very narrow tape and making cross sections many pleasing results may be obtained. The common spotted or variegated results are produced on a wheel 3 or 4 inches or more in diameter and ¼ to ½ inch face, arranged a little out of center, F. nickel rouge being used to remove the surface coating. There is thus a variety of pleasing variations possible, which may be produced according to the taste and the judgment of the operator.

THE BRUSH BRASS FINISH.

THE METAL INDUSTRY has been asked how to produce the "Brush Brass Finish" which is applied to electric light sockets and other small articles and in color and appearance resembles the finish known as "Old Brass." To produce the "Brush Brass Finish" the following method gives good results:

A regular machine brass wire scratch brush or satin finish brush of 6 inches diameter with four to six rows is used on a regular brush lathe at a speed of from 1,200 to 1,500 revolutions a minute. Provision is made for a trough containing water with a small amount of sal soda added to soften the water. Pulverized pumice stone is applied with a rag moistened with water to the brush and the work is revolved with slight pressure against the wheel. This gives the effect. The goods are then rinsed in cold water, passed through a dilute cyanide solution, dried out and lacquered with a good dip lacquer. If the work is smooth no preliminary finish is necessary, but if not the goods will have to be cut down on a rag wheel, using tripoli to get a smooth surface, afterwards potashed to remove the grease and then brush finished.

DANISH DETINNING PROCESS.

The Bergse process for the recovery of tin from tin cans is stated by Schon in a recent number of the Electrical Review to have been used in Copenhagen, Denmark, for the past two years. The cans are worked without cleaning and it is claimed that not only the tin in the tinning is recovered, but also that in the solder. The cans are worked without cleaning; a hole is cut into their bottom and they are thrown into baskets of iron wire, where they remain during detinning. A separation is made of the lacquered and unlacquered cans. This separation and perforation, as done by hand, costs about $1.00 per ton. The baskets are then placed in the detinning tanks, which are arranged in such a manner that the dissolving solution flows through them in succession. The solution consists of a solution of chloride of tin (stannic chloride) and contains about 2 per cent. of tin. This solution removes the tin and forms stannous chloride, the solution becoming stronger during its passage from tank to tank.

The detinning of 10 tons of cans per 24 hours requires a capacity of 3,500 cubic feet of tanks. The leaching liquid is stated to remain fit for use during a period of three or four months, after which time it has to be rejected, as it then contains a considerable amount of iron. The amount of iron which goes into solution is given as about 20 per cent. of the weight of tin gained. The tin solution is made by the leaching of scrap with the addition of oxidizing substances or by dissolving old tin in acid. All the dirt from the cans gathers on the bottom of the tanks.

The enriched stannious chloride solution is pumped from the last tank by means of a small brass pump and is distributed to the electrolytic cells, through which it flows. The anodes used in the cells are insoluble and the stannous chloride is split up into tin and chlorine, the tin falling down to the bottom of the tanks, while the chlorine liberated at the anode converts the stannous chloride there again into stannic chloride, the reaction being the reverse from that taking place in the leaching tanks. The tin is precipitated in small crystalline prisms about 3-16" long. The stannic chloride flows back again to the leaching tanks, thus completing the cycle of operations. The current used is stated to amount to 47 kilowatts or 65 electric horse power per ton of tin, and the latter is mechanically removed from the bottom of the electrolyzing tanks by means of a scraper run by machinery. All the solder touched by the liquid is claimed to be removed, only a greyish residue of chloride of lead being left. The process is carried out at ordinary temperatures, at about 70° F., heating being only necessary during winter. During electrolysis no ferric chloride is stated to be found when the quantity of tin is sufficiently great. It will only appear when the amount of tin is lowered to a certain degree, but this is easily prevented by increasing the amount of tin.

The detinned iron is used by cement copper works and brings a good price, as it is better than other scrap, on account of its being free from rust.

The treatment of new tin scrap, the so-called "detinning," is stated to have become of considerable importance in the United States, at least ten companies being actively engaged in this branch of the tin industry during 1903.

FRENCH SAND MOLDS FOR CASTING GOLD, SILVER OR BASE METALS.

By A. T. Salt.

The French sand when used new for fine work ought to be dried and ground. It is, of course, always good to be able to get a barrel of old sand to start on and to use the new sand for facing. The facing sand is composed of about one-half new sand ground and one-half old sand, sieved through a fine sieve. It is put in layers and whetted down and left to stand over night.

If it is to be used for false core work it has to be well blocked. This operation consists in riddling through a No. 8 riddle onto a board. It is then rubbed with a stick looking somewhat like a rolling pin. It is, however, not rolled but pushed so as to make it tough. It is then pushed through the riddle again. If care is taken not to get it too wet or too dry this makes a good sand for false core work.

If the sand is intended for flat work, one-third of new sand is plenty, and no blocking is required, but only riddling. It is then put into a stone crock until it is required for use.

Flat work can be laid on a board and the nowel or the flask laid on without any pins. Springfield charcoal, ground fine, so-called parting charcoal, contained in a cotton cloth bag of not too coarse material, say four inches wide and six inches long, is laid on the bench within easy reach of the molder.

The patterns being placed on the board and the flask put on, just a little of the parting charcoal is shaken on the patterns. Some sand from the crock mentioned above is then riddled on, just enough to cover the patterns. Some other sand is then sifted on through a coarser riddle until the patterns are covered about half an inch. The side is then filled up to the top. In the following operation care must be taken not to push or move the patterns. The sand is first rammed down with the fingers, care being taken to hold them straight. It is just packed down so as to hold the patterns in their place and to have the sand close on the surface of the patterns. The side is then filled up to the top again. A stick, about 1½ in. thick and about 14 in. long, rounded on the ends and loaded with lead, makes a good rammer for ramming the sand down. This operation is performed by packing the sand down on the surface again, going over it until it is packed evenly over. For gold and silver it is packed very close, while for bronze and brass goods it is not made as close, and for German silver still less.

After the sand is well rammed down in this manner the side is filled up again, this time about half an inch above the top. It is now packed down just once with the closed fist. More sand is then put on until it reaches about one-half or three-quarter inch above the side, after which it is flattened down with the mallet to within say a quarter of an inch above the top. It should be leveled then, a board placed upon the top and the side and the boards turned upside down.

The board upon which the patterns were laid is now taken off and it is observed whether there is any trimming to do or if there are any parts of the patterns that draw to the back. This is readily seen by taking a mallet and tapping under the board, which operation will loosen the patterns. Any breaking around the edges will then be noticed, which is then smoothed down with a slicker or steel tool. It is well to make this side clean and smooth by rubbing the slicker over the surface. This does not take long, but makes the work neater and a good many times saves the mold from sticking together. The bag containing the parting charcoal is then taken and the charcoal daubed all over so as to keep the cope from sticking. All the surplus charcoal is blown off and the cope placed on. The operation described above is then repeated as near as possible as far as hardness of ramming is concerned. If it is made harder it will drive the face from the edges of the patterns and if it is too soft it will allow the metal to cut in. It is finished in the same manner as above and a board placed on top. The top is then tapped and the mold opened. The patterns are brushed and a very little parting charcoal is dusted over.

The side which was lifted off has now to be faced. If the sand is a little dry, a very little water from an atomizer or with the mouth is sprayed on. The side is then moved two or three feet away from the bench and put in a box or any convenient place. For facing a cotton cloth bag is used, of the same texture of material as that for the pasting charcoal. It is filled half full of loam, which is made by grinding dried French sand and red brick clay, the same as is used for lining ladles in the iron foundries or for making brick, about one-third clay to two-thirds French sand. This is shaken on and the surplus blown off. The side is then moved to another box or convenient place. For the next operation pine charcoal is used, ground and bolted just as fine as it can be gotten. The cotton bag is filled half full and about a tablespoon full of the loam is added, the two ingredients being mixed as thoroughly as possible. The mixing is, of course, better performed before the materials are put into the bag.

The facing charcoal is shaken over the side and blown with a bellows. Enough is then shaken on to make say a paper's thickness all over. The requisite amount is readily found by experience, one good way of telling being to just press the finger on the surface of the side, of course not on the impression of the patterns. After this operation is performed the side is placed on the nowel again, taking care not to let them jar together. It is pressed down, the board is removed and the sand malleted down level with the top of the flask. The board is then replaced, the mold turned over and tapped and opened as before. The patterns are brushed, the side is treated with parting charcoal and faced in the same maner as the first side. When this is all done and the side closed on again, it is malleted down say half way to the top of the flask.

The mold is then rapped and opened again, the patterns are brushed and attention is paid that there are no specks of sand on the surface. A little parting charcoal is then shaken over the side faced last and blown off well. The mold is then closed again and malleted down to the level of the flask. The board is replaced, the mold is rapped and opened. The patterns are now removed with a piece of red clay. Some of the loam whetted down to the consistency of putty makes a good clay to draw patterns with. The mold is then closed on the face side so as to set down any edge that might have lifted while the patterns were drawn.

The mold is now ready to be gated. A runner is cut from the mouth of the mold to the patterns. Gold and silver do not need such a large runner as the base metals. The mold is then gated and the gates, runner or sprue is whetted down with water or black lead

mixed with water. The mold is then dried over night in an oven heated by gas or coal, taken out and the faces smoked with a torch made of rosin or kerosene put in a ladle. The mold is then closed, clamped and the metal is poured.

The writer has used this method for a good many years and it is being carried on now in one of the largest factories in the world. If everything has been done in the proper manner the castings come out perfect.

STERLING SILVER BEDROOM SUITE.

An order recently received by Messrs. Mappin and Webbe, of Sheffield, from an Eastern palace, is of such a kind as to interest every silversmith, as its execution involved much skill.

STERLING SILVER CHAIR.

It was for a complete suite of bedroom furniture in sterling silver, comprising twelve ordinary and easy chairs, two couches, four tables, one large cabinet, one dressing table, and a bedstead. The pieces are all modelled and chased in the style of the French "Louis" period, and the effect is shown by the illustrations, representing one of the chairs and a table. This furniture, reminding one of fairy tale days, is temporarily upholstered in dark blue plush, which will eventually give place to a costly silk brocade.

STERLING SILVER TABLE.

A great deal of thought has been expended on the bedstead, which embodies in its design allegorical panels copied from pictures by Mr. Albert Moore, of the Royal Academy. It suggests "slumber" in every detail. The display of the suite in the London show rooms of the company, naturally attracted much attention.

PURE NICKEL TUBING.

Pure nickel tubing was a feature of the display of the Standard Welding Company, of Cleveland, Ohio, at their exhibit in the Automobile Show, Madison Square Garden, New York City. This tubing is manufactured from sheet nickel bent into the form of a tube and then electrically welded. It is manufactured in a variety of sizes from a ⅛ inch wall down to a No. 22 gauge and of any length. The welding was done so perfectly that the joint was unnoticeable and it might have been taken for drawn nickel tubing which American manufacturers have had so much difficulty to produce. The Standard Company have been manufacturing the tubing for the past two months and report that they find a demand for it from the automobile manufacturers and from other sources where a strong non-corrosive tubing is desired. The tubing is used in the superheaters of automobiles. Rubber manufacturers are using the nickel tubing for the end pieces in some of their apparatus, the nickel tubing being welded onto a tube of steel. The rubber corrodes the steel but not the nickel and as the ends only are subject to corrosion the nickel end tubes are welded onto the steel. The Standard Company expect that their nickel tubing will be suitable for the surface condensers used in the Navy.

THE COMPOSITE AUTOMOBILE.

A view of an automobile even if it is located in an exhibition hall gives but a very remote idea of the variety of materials used in its construction. As far as the general beholder is concerned he can see that the machine is built of metal and wood, possibly all metal and that is about all he can tell from casual observation. In the recent New York Automobile Show there were opportunities to inspect all of the parts of the machine, running gear and top body and all of the different parts that make up the complete automobile. An examination of the running gear of one of the high power machines showed that among the various metallic parts there was a steel frame, cast iron cylinders, malleable iron crank case, bronze gear case, brass grease cup, copper cylinder tube and aluminum fittings. In the top part there were brass plated steel levers and steering post and a sheet aluminum body. The machine had bronze bearings. Besides the different metals and alloys mentioned there were several grades of steel and, of course, a number of different mixtures of brass, bronze and aluminum alloys in the various component parts. Taking it altogether the automobile certainly represents the composite method of construction.

WROUGHT COPPER HINGES.

Wrought copper hinges of large size were one of the features of an exhibit at the recent Automobile Show at Madison Square Garden, New York. They were manufactured by the English & Messick Company, of New Haven, Conn., and are quite a novelty in the automobile mountings trade, having been but recently placed on the market. Their greater tensile strength is claimed as a considerable point in their favor when compared with cast brass hinges.

MODERN MOLD MAKING.

By George H. Chandler.

At no time in the history of the manufacture of britannia and white metal goods has there been a greater demand for the artistic, the sumptuous and the unusual, and at no period during the past twenty-five years has there been a more critical clientèle. Designers, modelers and mold makers are constantly producing new and novel effects to meet the ever-changing demand to match every school of decorations.

The following photographs show how a large one-piece white metal hollow casting was made. Its measurements at the base are 16 inches square, gradually tapering to the top, which is about 8 inches square. The height is 28 inches. The casting weighs 12 pounds finished. The subject presents a new departure in twentieth century lamps. The lamp was originally modeled for the Cuban and Philippine trade, and the design is quite unique, representing a large vase. It is massive in construction, but still very

THE FINISHED LAMP.

light in weight compared to its size. One panel shows the condition of Cuban and Philippine farms before the Spanish-American war, while the opposite panel represents a New England farm. The third panel commemorates the descent of President Roosevelt and his Rough Riders after the battle of San Juan Hill, and the fourth one the entrance of Admiral Dewey into Manila bay. The panels are executed in bas-relief.

The photographs show the construction of the mold, which is made entirely of bronze metal and weighs 236 pounds. The cost of this mold, including the bronze castings, modeling and chasing was about $550. Each photograph shows the separate pieces and the way the mold is put together ready for casting.

When casting these lamps three men are required. While two men are pouring the metal from a ladle, which holds 300 pounds, into the mold, one man controls the mold which swings between racks built for that purpose. It requires less than three minutes to cast a perfect lamp.

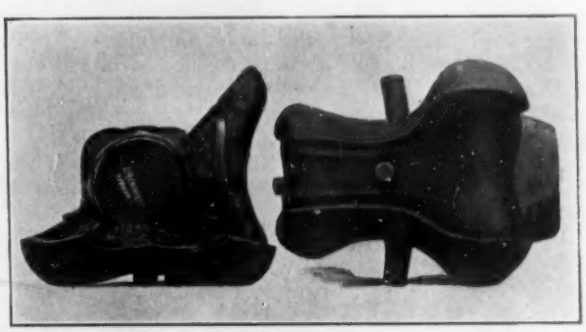
In making the plaster mold, dental plaster must be used and also soft water in order to prevent any great amount of shrinkage, which this plaster is noted for. Piece No. 1 is the first part to make, as it is the bottom

NO. 1. NO. 2.

of the lamp and acts as the gate at the same time when the plaster is partly set. The cutting of this piece must be, like that of the other pieces, thoroughly figured out before starting. The plaster should be about one-half inch thick at every part. Extra care must be

NO. 3, RIGHT AND LEFT. NO. 4, RIGHT AND LEFT.

exercised in cutting the plaster to this thickness at all points, no matter how many curves and shapes it may have. The plaster when cut ready to sandpaper ought to be the same thickness all over, so that the shrinkage in the bronze casting will be equal. After the plaster



NO. 5. NO. 6, THE COMPLETE MOLD.

is sandpapered smooth, two coats of shellac are applied with a brush. The shellac ought to consist of about one pint of mixed shellac to one quart of grain alcohol. When the shellac is dry work is started on part No. 2, which is the top part of mold. The same treatment as above is applied to parts 2, 3 and 4. The parts 1, 2, 3, 4 should then be placed upon the model

and string used in order to hold the parts together in place while the two outer sides are made.

The model must be oiled with a brush, just enough oil being used to prevent the plaster from sticking to it as well as to parts 1, 2, 3, 4 and 5. Some mold-makers cut lugs of various shapes to hold the mold and the pieces together. Others use dowel pins made of steel wire one-quarter inch diameter, three-eighth-inch long. This is strictly a matter of taste, as all styles are good. When the plasters are made, shellacked and dry, the broken edges and blow holes must be waxed up and then shellacked again. On the back of each plaster, when a handle is wanted, a circle is cut in to show the molder where the handle is to be. He will put it on when molding the pattern.

Greater care should be used in venting molds. Too many vents cannot be put in a mold, and in nine cases out of ten the trouble with castings that have so many fine pinholes is that the molds are not vented enough. The venting of a mold can be done so that it will hardly show in the casting. Venting the molds with octagon-shaped plugs is done by drilling a hole through the mold at any spot and at any angle. Copper wire about four sizes larger than the hole is then put in a hand vise and filed tapering on all eight sides. A plug is then cut off and driven into the hole, after it has been partly fitted to the hole. The top is chased over lightly, or, if plain, filed smooth. It is held up to the light and all that is wanted is to see daylight through the eight sides. This space will allow the air to get out and the castings will be sound and solid. The same rule applies to all white metal castings, whether they be of spelter, 14-pound metal or britannia.

The metal used in casting these lamps is made from the following mixture, which must be mixed carefully:

100 lbs. lead, best quality.
58 " tin, Straits.
14 " antimony, Crook's.
2 " copper.
¼ " phosphor tin.

After the metal is mixed use a large soup bone or raw potatoes wired on an iron rod, insert the rod down to the bottom of the kettle and make it fast. Let the metal cook for two hours, then remove the potatoes or the bone and skim off the metal with a skimmer ladle.

In case plaster models are wanted from the molds instead of wax or metal, the mold is oiled with sweet oil, very light. Then dental plaster is mixed with water and poured into the mold and allowed to set. When dry the plaster models are boiled in starch for five minutes. They are then brushed off with a dry sable hair brush and allowed to dry. The plaster models will resemble fine marble.

The modeling wax for modeling articles and patching up broken parts on plaster molds consists of the following ingredients:

1 pound beeswax, best quality.
2 cakes white wax, 5-cent cake.
1 ounce Burgundy pitch.
½ ounce sweet oil.
½ ounce yellow ochre.
½ ounce Venice turpentine.
Color with English vermillion.

If the wax is too hard a little mutton tallow is used; if too soft, more white wax.

The following receipt is for impression wax. In case the wax is to be cast in the mold, the latter must be oiled first very lightly with the brush. The wax is melted, poured in and not disturbed until it is perfectly cold. The wax must not be too hot, but poured rather cold:

Beeswax, 2 pounds.
Cake white wax, 1 pound.
Sweet oil, one tablespoonful.
Plaster of paris, 1 pound.
Color with lampblack.

In case a drawing is made with lead pencil of any ornament or border and the design is to be cut into sheet brass or bronze mold, the varnish is applied with the brush or the finger. The object is covered very thinly. When the varnish starts to set, the drawing is laid on the sheet of brass, beeswax or soap rubbed on the back of the drawing and a burnishing tool is used to rub the back of the drawing. Most all the lead pencil marks will stick to the mold and will not rub off, while the original drawing can be saved by lifting up one end and pealing it off. The following ingredients compose the transfer varnish:

½ rosin, powdered.
½ turpentine.

The mixture is left to stand for four days, and is then shaken well and used.

For impression wax or pattern wax the following formula is used:

1 pound beeswax.
3 ounces rosin.
2 ounces rock candy.

When using this wax to take impressions from plaster of paris mold kerosene oil is used instead of sweet oil. Sweet oil is used when taking wax impressions from brass or bronze molds.

The following formula for making mold bronze castings is considered very good, provided that after the sand molds are made they are faced with French sand and lycopodium and then baked or face dried. The mixture consists of:

30 pounds copper.
2 pounds tin.
11 pounds yellow brass.
1 pound lead.
¼ pound antimony.

The metal is cleaned with phosphor tin, ¼ pound.

ALUMINUM AT THE AUTOMOBILE SHOW.

A striking exhibit at the Automobile Show was that of the aluminum castings shown by the Light Manufacturing and Foundry Company, of Pottstown, Pa. This company manufactures castings in brass and bronze, but their principal display was in aluminum castings of a most intricate shape, including a great variety of cylinder bases. They also showed a model of an automobile, the body of which was of aluminum, while the wheels were of bronze. The company exhibited a number of test bars, giving the results of tests of their aluminum alloy.

There were few automobiles at the exhibition but what contained aluminum as a component part of their construction, either in the form of sheet or of castings, but as the metal was usually painted or enameled or covered over by the top part of the machine, it was not as distinguishable as some of the other metals.

The silver yield of the United States for 1903 amounted to 54,300,000 fine ounces, with a commercial value of $29,322,000.

THE CASTING OF ALLOYS CONTAINING ALUMINUM.

As many of the alloys, notably manganese bronze, contain less than 1 per cent. of aluminum, the introduction of such an amount into the alloy deserves special consideration. Suppose fifty pounds of mixture is to be made up, and the amount of aluminum to be added is a quarter of 1 per cent. Then the actual weight of this metal to be added is only two ounces. How many brass foundries possess scales which will weigh two ounces accurately? The foundryman may have scales with two ounce notches, but if the maximum weight which the scales will weigh (as it usually is) is, say 300 lbs., then the weighing of an amount so small as two ounces upon them is not by any means an accurate operation. Indeed, it is, under such auspices, an extremely inaccurate one. The foundryman is certain to get too much aluminum, and thus the mixture is spoiled. Cases have been known where four or five times the proper amount of aluminum, or other metal which is added in small amount, has been introduced simply on account of not knowing how to introduce the material properly.

Although scales may be obtained which will weigh this small amount accurately, and indeed such scales or balances are very useful for weighing the lead and tin, the amount of aluminum to be added is so adjusted to the mixture that there is very little leeway if the highest results are desired. As copper alloys are very sensitive to small additions of aluminum, it is absolutely necessary that the proper amount should be introduced into the mixture. In order, therefore, to avoid the difficulty heretofore mentioned in the above remarks, the method of procedure should be as follows:

Let us suppose, for example, that a copper alloy is to be made which is to contain a quarter of 1 per cent. of aluminum. Now make up an alloy of copper and aluminum containing 90 per cent. of copper and 10 per cent of aluminum (10 per cent. aluminum bronze), pour into ingots, and use for the introduction of the aluminum into the mixture required. It is obvious that, in order to obtain a quarter of a pound of aluminum from this rich alloy that it will be necessary to take ten times as much as the amount of aluminum required, or in other words, two and a half pounds. This method of procedure will give a weight large enough to weigh accurately, and without the liability of error that is apt to take place in the use of the pure aluminum. A more thorough incorporation of the aluminum is likewise insured, as the aluminum bronze will mix with the other metals more thoroughly. It is perhaps unnecessary to add that the weight of the rich aluminum bronze alloy used must be deducted from the weight of the required amount of copper in the alloy, as the former, of course, contains considerable.

In making aluminum alloys for strength it is bad practice to use any but the purest materials, as impurities like lead or antimony seriously affect the strength and ductility. The best brands of Lake or electrolytic copper, refined spelter, or pure nickel should be used. Melt the copper under charcoal in a crucible, and if nickel is to be introduced into the alloy put it in the crucible with the copper. When melted and at the proper temperature add the rich aluminum bronze mixture in the proper amount, stir, and then add the spelter. No lead should ever be added to metals requiring strength. Now pour into ingots, but not into castings, as no copper alloys containing aluminum are fit to use on the first melting. For some unexplained reason they are deficient in strength. Upon the second melting they will be satisfactory. This is a point which should not be overlooked. High tensile strength cannot be obtained unless this method is followed.

Great care must be observed in using the proper mixtures, and not to add more or less than the proportions given. For instance, in the manufacture of manganese bronze containing a large amount of zinc it is necessary that the alloy should not vary more than 1 per cent. in this metal; otherwise the ductility suffers. It may be said that there is no class of work in the non-ferrous metal industry which requires the care and pains in making that is necessary for the manufacture of alloys for high tensile strength. Nothing can be done which will in any way cheapen the mixture without sacrificing the results.

Given the alloy made from the very best materials and of the right proportions, there is much left to be done in the way of casting. This part is far more than "half the battle." No matter how well the mixture may have been made or from what proportions, unless a molder understands his business no uniform results can be obtained or any high tensile strength. There is no class of work more difficult to mold or none so susceptible to poor work as the copper alloys containing aluminum. The very highest tensile strength obtainable with the copper alloys may be obtained with aluminum as an ingredient, and, it may be said without hesitation, that the very poorest may likewise result. Given the proper mixture of metals, it is up to the molder to obtain what is desired.

One trouble in casting copper alloys containing aluminum is overheating the metal and pouring at too high a temperature. These alloys, although appearing sluggish, are in reality not, and in order to obtain the best results should be poured at as low a temperature as possible, and *the metal should not be allowed to overheat in the fire.* Do not let the melter have his metal ready before the molder has his molds ready for pouring. There is more bad metal made in this manner, and more waste results, than in any other manner. It is not superfluous to let the molder have his molds ready before the metal is put into the fire. By this method, therefore, the metal may be poured at the moment that it is at the proper temperature. If the metal can be melted and poured at the proper temperature without the use of gates or scrap for cooling, then the results obtained will be found worth the trouble. Where the best results are obtained this method of procedure is followed.

As for the right temperature or "heat" of the metal, it may be said that the lowest temperature at which the metal will run and fill the mold properly is the one to be used. A metal which is actually pasty, or runs thickly, is not capable of giving good results, but if too high a heat is used the castings will lack the strength, although they may look fairly well. Castings have been seen which would show nearly twice as much strength when poured at a low temperature as they would at a high one, and this point must continually be borne in mind. Those who are used to casting

brass and composition are apt to overlook this feature.

Green sand may be employed, if not too wet, and equally as good results may be obtained with green as dry sand if properly worked and the mold well vented. The use of the skim gate, horn sprue, and gaiting from the bottom are features which have been described in THE METAL INDUSTRY at length. These precautions are necessary for the obtaining of good results.

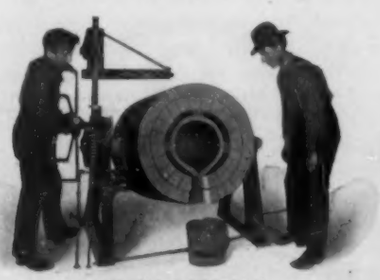
If there is one feature, however, to which attention should be called in the casting of these aluminum alloys, it is the matter of pouring temperature. If it is carefully noted, and the heat of the metal guarded, good results will follow. The questions of heats is probably the cause of more failures in this direction than any other source.

METAL MELTING AND REFINING FURNACE.

The furnace illustrated in the accompanying figure is intended to be utilized for melting copper, brass, tin, lead, zinc, phosphorbronze, German silver, aluminum, scrap, cast steel and foundry drosses, and is claimed to be specially adapted to the melting of yellow metal and brass borings and trimmings. It consists of an

MELTING POSITION.

outer steel shell lined on the bottom and the sides with a double row of firebrick. The charge is placed in a crucible, which rests on a square graphite block placed on the bottom of the furnace. The crucible is always retained within the furnace, thereby losing no heat in cooling off and extending its life. The furnace



POURING POSITION.

cover is lifted by an automatic lifting device and is so hung up between trunnions that it can be tilted at any angle, both operations being performed by the furnace tender at one time. The furnace is heated by a specially constructed burner which is operated with both oil and air and is under control at all times by the main piston valve, which operates with a needle point at the extreme oil outlet, thereby giving to the burner the advantage of a vaporizing effect and a freer circulation of oil and air. The furnace occupies a floor space of about 3′ 6″ × 4′ 6″, and is made to contain No. 40, 60, 125 and 275 crucibles. The furnace in shipping order will include crucible, burner and firebrick and will weigh from 1,700 to 2,600 lbs. gross. The burner consumes from 10 to 15 cu. ft. of air per minute at from 50 to 80 lbs. pressure. As the flame does not bear directly upon the crucible, the life of the latter is from 20 to 50 heats for the larger and 60 or more heats for the smaller sizes. In regard to the melting loss in a furnace of this type, tests made by a large foundry near Baltimore melting a mixture of hard metal brass gave the following result: December 19, 4 heats, loss 1.04%; Dec. 20, 3 heats, loss 1.19%; Dec. 21, 4 heats, loss .96%; Dec. 22, 3 heats, loss 1.03%. The oil consumption averages 1½ gallons per 100 lbs. of metal. The furnace is manufactured by the Monarch Engineering and Manufacturing Company of Baltimore.

BRASS AT THE AUTOMOBILE SHOW.

Brass was very much in evidence at the recent Automobile Show held in Madison Square Garden, New York. About every machine had brass lamps and brass ornaments, and a visit to the balcony of the Garden might have given the visitor the impression that he was in a brass gallery. There was brass everywhere. Brass lamps, brass searchlights, brass tubing, brass castings, brass horns, brass hardware; in fact, everything but the fetching "brass buttons." It was the showy part of the show. One of the exhibitors reported that as manufacturers of motor lamps and searchlights and other automobile sundries, they were the largest single consumers of a brass and copper rolling mill. This in itself indicates what the automobile has done for the brass and copper industry. Among the exhibitors in the "brass display" at the Garden were: The Badger Brass Manufacturing Company, Kenosha, Wis.; Gray & Davis, Amesbury, Mass.; the Rose Manufacturing Company, Philadelphia, Pa.; the C. T. Ham Manufacturing Company, Rochester, N. Y.; Joseph W. Jones, New York City; the Motor Car Equipment Company, New York City; the Lunkenheimer Company, Cincinnati, Ohio; the English & Mersick Company, New Haven, Conn.; A. H. Funke, New York City; the Dodge Lubricator Company, Newark, N. J.; Luigi Angiulli, New York City; the Scoville & Peck Company, New Haven, Conn.; Rushmore Dynamo Works, Plainfield, N. J.; Weston-Mott Company, Utica, N. Y.; Boston Auto Gauge Company, Boston, Mass.; the William Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa., and the R. E. Dietz Company and the Gleason-Peters Air Pump Company, New York City.

A brass company writes: "From what we see of THE METAL INDUSTRY we think it is the best paper published for the brass trade, and every one in the brass industry should have it. We cannot afford to be without it."

CARBORUNDUM FIRESAND.

By F. J. Tone.

The products of the electrical furnace form to-day an important and rapidly growing aid to the metallurgist. By the use of this mode of heating it is now possible to produce a large number of metals and alloys, such as ferro-chromium, ferro-silicon, ferro-vanadium, pure silicon, pure chromium, in greater purity and of higher quality than by previous methods. This is due chiefly to the higher temperatures available and to the better control of heat and of other conditions affecting the reduction of the ores.

The question then arises, Why should not this new chemistry of high temperatures make possible also new refractory materials of higher qualities in respect both to their resistance to fusion and to chemical change? The field is an interesting one and many lines of investigation at once suggest themselves, but it is desired here to simply note some of the special properties of carborundum firesand, a refractory material of comparatively recent application but of growing importance. The crude materials from which it is formed are coke and silica sand. Carbon is one of the most refractory materials known to the metallurgist, its point of volatilization being, in fact, higher than that of any other substance and only attainable in the intense heat of the electric furnace. Silica also is one of the most important of refractories and if it were possible to combine all the valuable qualities of these two substances in one, the result would be an almost perfect refractory.

Carborundum Firesand has many valuable characteristics. Among its physical properties it may be noted that it has a specific gravity of 2.7, is of a grayish-green color, granular and easily crushed. Chemically it is classed with the so-called silico-carbides, which are compounds of carbon and silicon with or without oxygen. In an oxidizing atmosphere it slowly undergoes a surface oxidization.

Carborundum firesand is of especial interest to the foundryman on account of its wide use in the construction of brass melting furnaces. With the introduction of fuel oil and gas-fired melting furnaces new conditions were encountered which the various refractory materials heretofore employed could not meet. Certain portions of the lining were subjected to very high temperatures, under which ordinary fire brick or even magnesite or chromite linings entirely failed. The most exacting conditions, however, in the matter of resistance to the high temperature of the oil flame and the scouring action of copper and brass slags are met by the use of carborundum firesand. Mixed with the proper binding materials, the entire lining may be rammed up in a solid block, having no joints and presenting a smooth glazed surface of high refractivity and good mechanical strength. For this purpose silicate of soda is the binder most commonly used. It is diluted with water to a thin syrup of a density of about 33° Be. and a mixture formed consisting of 90 parts firesand and 10 parts of the solution of silicate of soda, these proportions being made by weight. When thoroughly incorporated the constituents form a plastic mixture which is easily molded and has a sufficient cohesion when tamped into place to retain its shape until fired. A center of iron or wood is provided, the dimensions of which conform to the shape required for the interior of the furnace. The firesand mixture is rammed solidly between the center and the iron shell of the furnace and after the removal of the center the lining is dried out with a slow wood fire. By bringing the furnace slowly up to heat it can be at once put into service. This method of molding the entire lining into place has many advantages, the most important being that it avoids the weak feature of joints. The joints are undoubtedly the weakest point in any furnace lining built of fire brick. When made with the greatest possible care, they always present to the flame spaces where the volatile fluxes can lodge and where the slag can scour its way between the brick, with the ultimate result that the bricks are loosened and the lining destroyed. However, by molding the lining in place in a solid mass no costly shaped bricks are required, and it is possible to retain the irregular, curved surfaces which are needed for the proper deflection of the flame and for the openings of the furnace.

The regular type of crucible brass furnace with a lining built up out of carborundum firesand will outlast several firebrick linings. The mixture consists of 80 per cent firesand, 10 per cent. No. 1 fire clay and 10 per cent. silicate of soda solution. A sheet iron core is provided of the same diameter as the interior of the furnace and the mixture is rammed up between the center and shell. This lining will last indefinitely without replacement and requires, moreover, no skilled labor in its construction. The clinkers and ashes show very little tendency to adhere to the lining and there are no joints to scour out.

A mortar composed of carborundum firesand and fire clay is now finding a wide number of uses. It consists of from 50 per cent. to 60 per cent. firesand, the balance being No. 1 fire clay.

Reverberatory furnaces for the smelting of lead and copper, constructed with side walls laid up with the carborundum firesand mortar give very successful results. A slush of the same mortar spread over the arch when laid dry will fill the joints and prevent the corroding action of the flame between the bricks. The same mortar is used as a patching material in various types of furnaces, such as the Tropenas converter and converters of similar types used extensively in the making of steel castings.

THE BRASS MANUFACTURERS.

At a largely attended meeting of the Brass Manufacturers' held at the Hotel Imperial, New York City, on Wednesday, January 18th, prices were advanced 5 per cent. The following officers were elected: President, John J. Ryan, of J. J. Ryan & Co., Chicago, Ill.; vice-president, T. J. Torrance, of Standard Sanitary Manufacturing Company, Pittsburg, Pa.; trustees, E. C. Register, of J. Register & Sons Company, Baltimore, Md.; Jno. D. Brazier, Powhattan Brass Company, Charlestown, W. Va.; H. J. Huerina, Sanitary Company, Cleveland, Ohio; W. H. Wasweyler, Milwaukee Brass Manufacturing Company, Milwaukee, Wis.

Stephen A. Ginna, president of The Vulcan Detinning Company, whose offices are at 157 Cedar street, New York, died suddenly on Sunday, January 15th at the Astor House, New York City, as a result of a stroke of apoplexy. S. R. Beardsley has been elected president in place of Mr. Ginna.

CORRESPONDENCE DEPARTMENT

In this Department we will answer any question relating to the non-ferrous metals and alloys. Address THE METAL INDUSTRY, 61 Beekman St., New York

Q.—A correspondent asks for a solution for bright silver plating on Brittania metal.

A.—The silver plating of Brittania metal does not present any special difficulties if the articles have been properly cleaned and have received the proper preparation. A bright silver solution is obtained by the addition of a small quantity of carbon bisulphide to the ordinary silver-plating solution. The carbon bisulphide should be added to a part of the solution contained in a bottle and the bottle shaken vigorously until the carbon bisulphide is completely dissolved. Attention has to be paid that this is the case, as any undissolved carbon bisulphide coming into the bath would do more harm than good. A small quantity of this solution is then added to each silver bath.

Q.—A plating firm informs us that they use a sulphuric acid, zinc sulphate solution for cold galvanizing, but that it works sluggishly at first. They ask for information as to the improvement of the solution in this respect. They have tried to add acid freely with no result.

A.—You do not give the composition of your solution, especially with regard to the relative proportions of acid and zinc salt. The addition of a large quantity of free acid evidently will not remedy your trouble. A solution of the following composition has worked successfully: Zinc sulphate, 35 ounces, concentrated sulphuric acid 1-10th ounce to the gallon of water. A high current density should be used with this solution when the articles are first put into the bath. After a few minutes this can be reduced to about 15 amperes per square foot of cathode surface.

Q.—A plater asks for a solution for cheap gilding novelties.

A.—A solution used for cold gilding contains 6 dwt. of chloride of gold, 2 oz. of potassium ferrocyanide and 1½ oz. of carbonate of soda to the gallon, to be used with a fine gold anode.

Q.—A subscriber wants to know a good dip for iron before plating. When he takes the work out of the potash bath it seems so hard to get it clean and the color is not there.

A.—A bright dip for iron consists of sulphuric acid, nitric acid and metallic zinc, and is made by pouring slowly 12 ounces of concentrated sulphuric acid of 1.84 specific gravity into one gallon of water, while constantly stirring the solution. Metallic zinc, 1 oz., is then dissolved in the solution and 5 ounces of strong nitric acid is added to the whole. This addition, like the previous one, has to be performed slowly with continuous agitation. Care should be taken that the articles do not remain in this dip too long a time and some experience is required in handling it. It may be possible that your potash solution is too strong, inasmuch as such a solution is apt to discolor the work and to necessitate much scouring. Your potash dip should clean the work thoroughly but should not discolor it.

Q.—A plater wants to know what is better than sulphide of potash for gun metal finish.

A.—See Mr. Proctor's article at another place in this issue.

Q.—A plating firm writes that the plater has just made up a new silver solution of 1¼ ounce of cyanide of silver to the gallon, taken up with 98% cyanide of potassium, registering 3½° Beaumé. They cannot get a reguline deposit, as the silver seems to deposit in black and brown spots in blotches. In spots which are white there is but a very light deposit and the action on the anodes seems of a bright, crystalline character. They ask for the cause of the trouble.

A.—The data given are insufficient to give a definite opinion. It looks as though your solution contained too much potassium cyanide compared to the amount of silver present, as under these circumstances discoloration of the kathode sometimes occurs. The action on your anodes also seems to indicate something of that character. It is taken for granted that your current density is not abnormally high and that your potassium cyanide is pure, as you state.

Q.—A subscriber informs us that he has tried the new method for silvering glass given in the November, 1904, issue of the METAL INDUSTRY, but has not been able to succeed with it. He tried it on flat glass with about ⅛" deep solution and the silver arose on the top, while none went on the glass. A wine glass full of solution showed a silver deposit around the edge only.

A.—It appears as though the depth of the solution was too much, and half that depth would probably give a better result. As the chemical reaction brought about by the action of the light only takes place at the surface of the solution, the depth of the solution in the wineglass would be too great and the deposit of silver around the rim of the glass is to be expected.

Q.—A Canadian plater asks for a hot and cold solution for plating brass on malleable iron. He also wants to know whether there is any particular difference in using the chlorides and acetates of zinc and copper in place of the carbonates.

A.—The METAL INDUSTRY for April, 1904, p. 55, contains an article on "Brass plating solutions, their use and abuse," which contains the desired information. If a good color of the deposit is to be obtained, care has to be taken that the quantity of free cyanide in the solution is not too great. By free cyanide is meant that amount of cyanide added to the bath over and above the amount required to get the carbonate of zinc and copper into solution. The proper regulation of the current is also a great factor in obtaining a well colored deposit. In regard to the difference between the carbonates, chlorides and acetates, it may be said that the copper and zinc carbonates are usually prepared by precipitation with sodium carbonate from the sulphates of the respective metals, which are quite well adapted for the purpose. As the intention is to prepare a copper zinc cyanide solution, it is much better from the standpoint of avoiding a needless complication of the solution, to dissolve the carbonates of copper and zinc, prepared from the sulphate, in potassium cyanide. The introduction of chlorides and acetates into the plating solution is thus avoided and better results no doubt can be obtained.

Q.—A subscriber asks for a solution for cold electro-galvanizing. He also wants a solution for black oxidizing on zinc.

A.—For the first question see answer to similar inquiry in this issue. A solution for black oxidizing of zinc is made up from 32 parts of water, one part of antimony butter and two parts of chloride of copper. The surface of the metal is cleaned from grease or oil and is introduced into the solution until the desired effect has been obtained. A thin coat of lacquer should be put on it if permanency of the deposit is desired, after washing and drying the metal.

Q.—A Canadian plating firm asks for the recipe for a stop off varnish to be applied with a brush on silver or other plated articles when gold plating is to be done in spots, the solution being supposed to be hot.

A.—See answer to a similar inquiry in THE METAL INDUSTRY, January, 1905.

Q.—A plater says that he has trouble with his brass plating solution, the anodes becoming covered with a deposit which will very soon prevent the current from flowing. He has tried to add sodium carbonate and finds that the anodes will soon coat over with a greenish deposit, which is not so objectionable as the other, but gives the same trouble.

A.—The indications mentioned seem to point to a lack of free cyanide in the solution, which shows itself by a deposit on the anodes, which is a non-conductor and stops the current. The deposition of the greenish deposit, which is in all probability copper carbonate, points towards the same thing, inasmuch as the bath is too weak in cyanide to dissolve this copper carbonate as fast as it is formed on the anode. To remedy this trouble, potassium cyanide should be added to the bath in very small quantities at a time, stirring the solution thoroughly while the addition is made. The addition of cyanide should be continued until the anodes work properly. They should, however, not remain bright when working.

Q.—A subscriber asks for information about the assaying of silver and floor sweeps which contain a lot of dirt.

A.—The principle of the silver assay depends upon mixing the material to be tested with litharge and fluxes and melting it, so as to collect the silver in the lead, which is afterwards oxidized, leaving the silver behind. Floor sweeps are first heated to get rid of the organic materials. The exact method of carrying out the assay cannot be described at this place, as it is quite complicated and can only be carried out by a trained assayer.

Q.—A brass foundry asks for a mixture for trolley wheel castings.

A.—A mixture used for this purpose consists of copper, 1 pound; lead, zinc and tin, each 1 ounce. An analysis of a sample gave the following results: Copper, 84.13%; tin, 7.28%; lead 5.06%, and zinc, 3.37%. The tin in this analysis is higher than that obtained in using the above mixture and is higher than necessary.

William Sellers, a veteran manufacturer of machinery, of Philadelphia, Pa., and president of William Sellers & Co., of that city, died on January 24th at the age of 81.

Hugh Caskey, a pioneer brass founder of Philadelphia, died at his home 1231 W. Allegheny avenue, in that city on January 17, 1905.

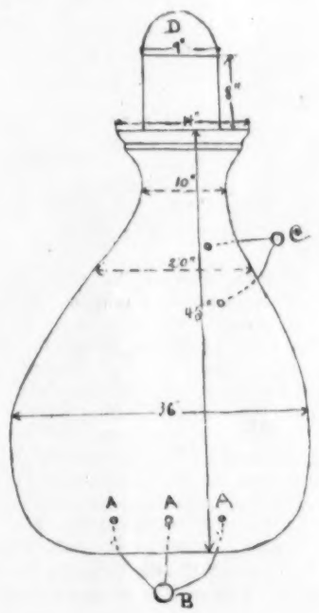
READERS' OPINIONS.

Correspondence is solicited from all of our readers on subjects relating to the founding, finishing, rolling and plating of the non-ferrous metals and alloys. Name and address must be given, though not necessarily for publication. Address THE METAL INDUSTRY, 61 Beekman street, New York.

CASTING A PROPELLER IN MANGANESE BRONZE.

To the Editor of THE METAL INDUSTRY:

The accompanying sketch will give a fair idea of the shape of the casting. The molding part of it is simple enough for any first class molder, but to have it gated and poured in a manner that will insure a perfect casting is the point that I will try and describe, so that it may be of some benefit to the man that has to make such a casting.



We used for a facing sand 1 part Jersey, 1 part Albany No. 0, 1 part old tub sand, and worked it the same as for any other ordinary work, pouring in a green mold. Five horn gates, marked A, and two pots, one No. 150 at B and one No. 100 at C, were used, taking a riser off at D. We poured this mold on an incline, raising the hub D about 10 inches above the gate B, pouring in at B about 200 pounds before pouring in at C. We then used both pots, which brought the metal up in the riser about one inch above the level of the highest point in the casting. We then poured water on the gates at B and C and put the pressure on a little at a time with an No. 80 pot, pouring down the riser (which was 14 inches high, taking 200 pounds of metal) and keeping the head open with a rod, churning the same as if for iron.

These castings came out of the mold without a sign of a shrink in any part. R. A. P.

The directors of the Manhattan Brass Company, of New York City, have elected Mr. Gilbert M. Smith, president and treasurer. Mr. Smith has been connected with the brass business for 23 years. The Manhattan Brass Company at present are very busy

PATENTS

A full copy of any Patent mentioned will be furnished for Ten Cents. Address THE METAL INDUSTRY, 61 Beekman Street, New York

777,278. Dec. 13, 1904. METHOD OF ETCHING METAL. John B. Davidson, Derby, Conn.—The method of etching metal consists in coating the surface to be etched with a varnish, placing upon the varnished surface lettering or a design in a comparatively dry alkali solution, then subjecting the article to the action of aqueous vapor whereby the varnished surface beneath the alkali will be removed, then subjecting the surface thus exposed to the action of acid, whereby the metal exposed through the varnish may be attacked.

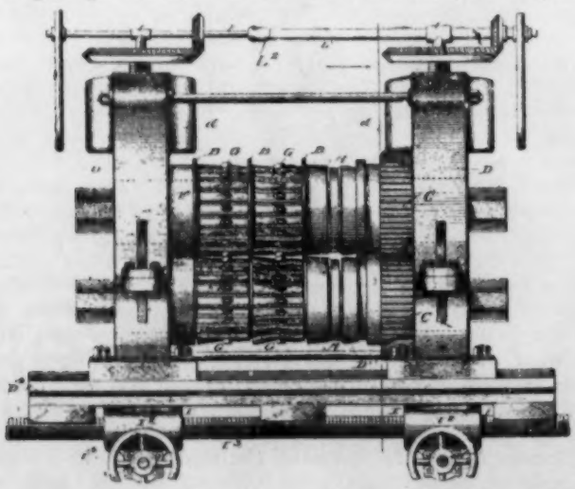
777,711. SOLDERING-IRON. Albert A. Ackerman, Chicago, Ill. Filed Oct. 22, 1903. Serial No. 178,082.—The appliance is a fountain soldering-iron, which has a valve-chamber through which

the solder is ejected, a reciprocating valve working in the valve chamber for ejecting solder therefrom and means for adjustably controlling the amount of travel of the valve for regulating the amount of discharge.

777,547. Dec. 13, 1904. BRAZING COMPOUND. Leigh Roy Schaap, Loveland, Colo.—The brazing compound consists of yellow prussiate of potash, plaster-of-paris, wood-charcoal, citric acid and borax combined in the following proportions: Yellow prussiate of potash, two ounces; plaster-of-paris, two ounces; wood-charcoal, one-half ounce; citric acid, one ounce, and borax, two ounces.

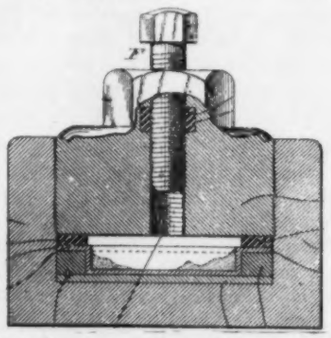
778,345. Dec. 27, 1904. PROCESS OF REDUCING METALLIC OXIDES WITH METALLIC ALUMINUM. Frederick C. Weber, Chicago, Ill.—The method of treating metallic oxides with aluminum in the production of metals and alloys, consists in subjecting the to-be-treated charge, comprising aluminum in admixture with a metallic oxide reducible by aluminum, both the aluminum and metallic oxide in the condition of a fine powder or granule, to an initial drying by steam heat for removal of the hygroscopic or ordinarily-present moisture thereby completely and absolutely dehydrating the material and then briqueting the dehydrated dry hot charge as a treatment preparatory to reduction of the charge.

778,890. Jan. 3, 1905. METAL-ROLLING MACHINE. Chester Prouty, Ridgway, Pa.—The machine for rolling metal consists of a combination of the cored housing, the shaft extending therethrough, a gear mounted on each end of said shaft, a bevel-pinion



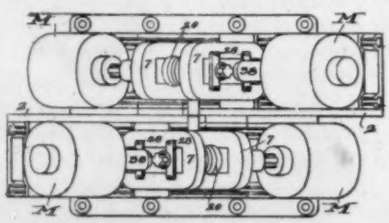
also secured to the upper end thereof, boxes slidably mounted in said housing, an adjusting-screw mounted in each end portion of the housing and each secured to one of said boxes, a shoulder formed near one end of each screw, a gear loosely mounted on said screw and adapted to bear against said shoulder, the upper and lower gears meshing, respectively, with the upper and lower gears of the shaft, a plate on the outer face of each of the gears on said adjusting-screws, said plate fixed against revolution upon said screw and adapted to bear upon said plate, and thereby clamp the gear between said plate and shoulder, whereby said boxes may be adjusted together when the gears are clamped, or independently of each other when the nuts are loose.

779,664. Jan. 10, 1905. HYDRAULIC EMBOSSING-MACHINE. James W. Nelson, New York, N. Y.—The hydraulic embossing-machine shows the combination with a recessed main body, which has an internal screw-thread, of a block which can be screwed into the threaded opening, a die in the bottom of the recess in the



main body, which die has a flat annular rim for supporting the rim part of the metal to be embossed, a packing-ring to rest on the rim part of the metal to be embossed, which packing-ring is to be pressed upon the metal to be embossed, by the screw-threaded block, screwed into the main body.

780,644. Jan. 24, 1905. MILL FOR POLISHING ROUND BARS. Victor Edwards, Worcester, Mass.—The mill for polishing round bars comprises the combination of the triangular frames 1 and 2 placed in reverse position to each other and united together at their base with the inclined faces of these frames provided with



tracks, roll-housing adjustably mounted on the tracks, a pair of rolls journaled in each of the housings, motors mounted on the frames with their axes in alinement with the axes of the lower rolls in each pair of rolls, motors mounted upon the frames with their axes in alinement with the axes of the upper rolls in each pair of rolls, and couplings connecting the motors with their respective rolls in alinement therewith.

779,639. Jan. 10, 1905. METHOD OF FASTENING ABRASIVE MATERIAL TO METAL BODIES. Edeson G. Case, Niagara Falls, N. Y.—The process for making, grinding and polishing surfaces upon suitable bodies consists in distributing a powdered or granulated abrasive material over the surface of the body and at the same time electroplating the body and abrasive material while the latter is being deposited on the body whereby the plating metal is deposited over and around the surfaces of the body and abrasive powder to permanently fix the latter to the body.

779,886. Jan. 10, 1905. METHOD OF SOLDERING. George H. Stewart, Los Angeles, Cal.—The method of soldering consists in bringing the parts to be united together, melting the solder by the application of a blast of heated air to the joint or contiguous metal and allowing the parts to cool.

779,887. Jan. 10, 1905. SHEET-METAL PLATE. George H. Stewart, Los Angeles, Cal.—The sheet-metal plate has upon it coatings of different materials, adapted, when united, to form a solder alloy, or has its opposite surfaces coated with different materials, which, when united with heat form a solder. One side may be coated with tin and the other side coated with a material adapted to form a solder alloy with tin, such as lead.

TRADE NEWS

Trade News of Interest Desired from All of our Readers. Address THE METAL INDUSTRY, 61 Beekman St., New York.

The Acme Wire Works, of Bridgeport, Conn., had a visit from burglars one night last month, but the thieves secured nothing more than a revolver.

Prices for 96 ounce hot rolled sheet copper have been advanced one cent per pound. The latest price list will be found on another page of THE METAL INDUSTRY.

In the spring the New England Pin Company, of Winsted, Conn., expect to put up a new four-story brick structure, 40 x 100 feet, to take the place of an old wooden building.

Frank H. Teel, formerly foreman of the Vaughn Machine Company's foundry of Peabody, Mass., has added a first-class brass foundry to his machine shop of the same city.

Absolutely acid proof stone ware for the use of platers and metal workers is manufactured by the Charles Graham Chemical Pottery Works, 889 Metropolitan avenue, Brooklyn, N. Y.

The Gordon Metal Company, of Richmond, Va., which was established in 1823 and is one of the largest and oldest houses in the South, report that business was better in 1904 than ever before.

Thomas P. Walsh, formerly of Norwalk, has formed a company and leased the plant of the South Norwalk Brass Company and has opened a brass foundry called the Riverside in South Norwalk, Conn.

The Morton B. Smith Company, 243 Front street, New York City, buy and sell scrap copper composition, brass turnings, drosses, etc. Correspondence solicited.

A catalogue of modern grinding and polishing machinery may be obtained by request from the Diamond Machine Company, of Providence, R. I. The Diamond polishing and grinding machines are used all over the world.

We have received word from Mr. H. D. Phelps that he is now settled in his new foundry on Beaver street, near Central avenue, Ansonia, Conn., and is well equipped for making heavy castings in aluminum, brass and composition.

The Sterling Pin Company, of Ansonia, Conn., have moved into the factory owned by W. S. & C. N. Downs on Housatonic avenue. In their new location the company now have more room to take care of their growing business.

One of the aluminum companies report that they have many inquiries for aluminum bobbins, but do not make them and are unable to find out who does. If any of our readers manufacture bobbins of aluminum, please communicate with THE METAL INDUSTRY.

The Canada Brass Rolling Mills, Limited, of Toronto, Canada, have engaged Mr. F. J. Wooster for superintendent of their mill. Mr. Wooster was formerly superintendent of the Waterbury Manufacturing Company. The Canada mill has started to roll brass and copper sheet and brass rods.

The Superior Pin Company, of Detroit, Mich., which was organized a year ago, has increased its capital stock from $75,000 to $150,000. Secretary-Treasurer Duffield reports a rapid growth of their business throughout 1904, and that their product is already sold for the year. The stockholders are enthusiastic over the results and are determined to make the factory one of the largest in the country.

A unique match holder in the form of a miniature crucible is being sent out by the McCullough-Dalzell Crucible Company, of Pittsburg, Pa. The match safe is certainly suitable for the desk of a brass founder or other users of crucibles. The company also issue an illustrated circular on crucibles.

The Vulcan Brass Works, 714 N. Fourth street, Allentown, Pa., reports a good business. The plant was established ten years ago by Richard Meisterknecht to manufacture all kinds of brass goods and brass, bronze and composition castings. The concern also does plating and makes a specialty of plain and ornamental castings.

The Parker Wire Goods Company, of Worcester, Mass., report that they have made arrangements with Messrs. Hale & Benjamin, of Greenfield, Mass., for the exclusive right to manufacture and sell the Hale & Benjamin blind hinges and the Hale combination awning hinges. The company report that the hinges have been on the market for a number of years and have given excellent satisfaction.

The Canadian Corundum Wheel Company, of Hamilton, Canada, reports a steady growth and have decided to branch out into vitrified wheels. For this purpose their works on Barton street are being enlarged. The company started the business six years ago in a small way and it is now supplying the greater portion of the wheels used by the largest industries of Canada. L. & H. E. Sherk are proprietors of the concern.

The Auto Brass and Aluminum Company, of Flint, Mich., furnishes us the following particulars of their new plant. The company are incorporated for $25,000 and the officers are: James W. Hines, president; J. George Snyder, vice-president, and Thomas D. Buick, secretary and treasurer. The company report that their equipment is the latest and best, and they solicit business in brass and aluminum castings and brass goods. The company manufacture various parts of automobiles and also sanitary supplies.

The Detroit business of the Allyne Brass Foundry Company, of Cleveland, Ohio, has grown to such an extent that the company have incorporated a separate concern in Detroit, Mich., to conduct a brass foundry business under the same title as the Cleveland company. A brick building, 80 x 155 feet is to be erected on Bellevue avenue large enough to employ 100 men. The plant is expected to be in operation early in the spring. The Allyne Brass Foundry Company manufacture all kinds of brass, bronze and aluminum castings.

An oil brazing furnace which burns kerosene and which brazes all metals, even to cast iron, is being marketed by Frank B. Many, 809 Cuyahoga Building, Cleveland, Ohio. Mr. Many reports that there is no odor nor carbon nor smoke to his furnace burners and the cost for one burner is $7.50, two burners $12. Gasoline furnaces can be changed to an oil furnace by simply changing the burners and fuel. This change, it is reported, removes the danger from fire and reduces the insurance rates. Further particulars can be had from Mr. Frank B. Many, 809 Cuyahoga Building, Cleveland, Ohio.

Fred L. Downs & Co., metal dealers of 213 Pearl street, New York, report that they now have their new copper works at Elizabeth, N. J., in operation. The plant has a capacity of 25,000 pounds of metal a day and covers one acre in the firm's two-acre lot. Fred L. Downs & Co. buy scrap copper and residues and sell ingot metal and report that they have a special process by which they are enabled to refine any copper bearing material and sulphur ores at a minimum of expense. They report that they have just closed some large contracts for ore which other refiners in the country found difficult to reduce.

Le Grand O. Robson, of Buffalo, N. Y., has issued a circular about the Totten soldering compound, which is used for soldering aluminum. The circular contains a number of testimonials of those who have used the solder.

The Stover Manufacturing Company, of Freeport, Ill., have remodeled their brass foundry, plating and polishing room, and added tinning and electro-galvanizing, and are now in shape for handling any business in this line.

The Pennsylvania Woven Wire Company has its new plant in operation at Lock Haven, Pa. The company have modern works, and at present will turn out painted wire screen cloth, but later will weave cloth in brass, copper and bronze.

We have received from Fox & Millea, 49 Taylor street, Springfield, Mass., a circular of their right and left nipple holders. By the use of the holder right and left threads can be cut and the nipple handled without marring brass or nickel plated work.

The Crampton-Farley Brass Co., 221 Main street, Kansas City, Mo., are sending out circulars calling attention to their Cansealo drains. In addition to a regular line of Fuller and Compression work, the company also manufacture the Star hopper valve and the Farley self-closing work.

The Peerless Heater and Valve Company, of Detroit, Mich., have completed their new foundry and finishing shop, 90 x 100. They have moved the Union Brass Works, which they bought last May, to the site of their present works. Their new building will greatly increase their capacity.

At the meeting of the directors of the recently incorporated Staples Valve Company, of Newburgh, N. Y., the following officers were chosen: President, John A. Staples; vice-president, C. H. Hanford; secretary and treasurer, H. B. Odell. The company will manufacture a new form of valve.

A class from a Brooklyn Public School recently visited the Brooklyn Foundry Company of the same city. Accompanied by their teacher, Miss Maud A. Read, they were shown through the works by the president, Andrew N. Peterson. The children were particularly interested in the brass foundry, as it was there that a brass tablet was cast for their school, and they had the opportunity of seeing the casting of several other bronze tablets which were being made for public buildings.

William H. Gohring, late superintendent of the Speakman Supply & Pipe Company, John T. Lally and James J. English, of the Wilmington Machine Company, have bought out the brass foundry and equipment of the J. D. Carter Company, of Wilmington, Del., and will operate it under the name of the Wilmington Brass Company. They will make high grade plumbers' supplies and specialties in brass. The company are adding a good deal of polishing, grinding and finishing machinery and nickel plating supplies to their equipment.

The firm of Lehman Brothers, metal dealers, smelters and refiners of Hoboken, N. J., are now settled in their new two-story brick building, 50 x 80 feet, located at the corner of Fourth and Jefferson streets. They still occupy their old quarters at 305 Grand street, but with the expiration of their lease in May they will conduct all of their business at their new plant. At present Lehman Brothers smelt white metals, but are rigged up for running brass ingot and will soon produce this alloy. They report that their business has doubled in 1904.

The Alaska Tin Mines Company, which is incorporated under the laws of the State of Rhode Island, have issued a prospectus about their Alaskan tin mines, which are located near Providence, Alaska, on Buck Creek. The company state that the total amount of tin consumed in the United States in 1903 was worth at market prices over $22,500,000, and of the total production of tin during 1902 and 1903 only about 30 tons were mined in the United States. The company expect to develop their Alaskan mines and supply part of the American consumption. Their home office is 308 Fourth avenue, Pittsburg, Pa.

The Isthmian Canal Commission, of Washington, D. C., have issued a proposal for machine tools, machinery, hand cars, leather belting, rope, canvas, rubber hose and nozzles, cars, and miscellaneous supplies. Sealed proposals in triplicate will be received at the office of the Isthmian Canal Commission in Washington until the 7th day of February, 1905. Further particulars for the supplies and machinery needed may be obtained of the Isthmian Canal Commission and of further proposals for materials which will be issued from time to time. The proposals issued so far have been more in the line of heavy machinery, but this last proposal and others to follow may require considerable supplies which are produced by the non-ferrous metal industry.

Richards & Co., of Boston, Mass., who have been selling metals since the year 1812, are now located in their new metal warehouse, situated next to the North Terminal Railroad Station, Boston, Mass. The company have issued a leaflet announcing their removal and containing some interesting information about Boston. One of the facts cited is that within 50 miles of Boston there are 2,849,686 people, showing that there are more inhabitants living within one hour's ride of the city than within the same distance of any other American city except New York. Richards & Co. have made their new store house the headquarters for visiting New England brass founders and metal consumers.

AN ALUMINUM SAFE.

A new aluminum novelty which is reported to be a good seller, both for advertising purposes and for the regular toy trade, is the miniature safe shown in cut. It is made by the Aluminum Manufacturing Company, of Two Rivers, Wis., and is nicely finished and decorated according to the purposes it is to be used, whether for a toy or for advertising. The Aluminum Manufacturing Company are continually getting out new goods and have a special department for designing and producing novelties. As fast as a new novelty wears out and the sale diminishes, the company take up something new. At the same time they steadily manufacture a line of goods which are standard and always in demand.

"A TEAKETTLE BALL."

An industrial party called affectionately "The Teakettle Ball" was given by the directors of the several companies which constitute the brass and copper industries of Rome, N. Y. These companies are: The Rome Brass and Copper Company, the Rome Tube Company, the Rome Manufacturing Company and the Rome Metal Company. The ball took place on the 29th of December, 1904, in the new mill of the Rome Metal Company, which has a ground floor space of 210 x 210 feet, and which was none too large to hold the 5,000 people assembled, consisting of the employees, their friends and invited guests. The party was said to be the largest ever held in Central New York. Mr. Jonathan S. Haselton, the managing director of Rome's brass industries, conceived the idea of giving the party in the room of the new mill before the machinery was placed in position. The decorations consisted of the various articles made by the combined industries such as copper teakettles, brass and copper tubing, brass and copper sheet, brass curtain poles, brass scroll work, etc. A brass band and an orchestra kept the dancers moving until an early hour in the morning.

PATENT FOR SALE of an oil brazing furnace. Will braze all metals, including cast iron. The furnace can be manufactured at comparatively low cost and brazes at less cost than a gasoline or gas brazing furnace. For further particulars address THE METAL INDUSTRY.

Metal Prices, February 1, 1905

METALS

	Price per lb
TIN—Duty Free.	
Straits of Malacca	30.25
COPPER, PIG, BAR AND INGOT AND OLD COPPER—Duty Free. Manufactured 2½c. per lb.	
Lake	15.50
Electrolytic	15.25
Casting	15.00
SPELTER—Duty 1½c. per lb.	
Western	6.50
LEAD—Duty Pigs, Bars and Old 2⅛c. per lb.; pipe and sheets 2½c. per lb.	
Pig Lead	4.50
ALUMINUM—Duty Crude, 8c. per lb. Plates, sheets, bars and rods 13c. per lb.	
Small lots	37.00
100 lb. lots	35.00
1,000 lb. lots	34.00
Ton lots	33.00
ANTIMONY—Duty ¾c. per lb.	
Cooksons	8.50
Hallets	9.00
Other	8.00
NICKEL—Duty 6c. per lb.	
Large lots	40 to 50
Small lots	50 to 75
BISMUTH—Duty Free	$1.50 to $2.00
PHOSPHORUS—Duty 18c. per lb.	
Large lots	45
Small lots	65 to 75
	Price per oz.
SILVER—Duty Free—Commercial Bars	$0.61
PLATINUM—Duty Free	19.00
GOLD—Duty Free	20.00
QUICKSILVER—Duty 7c. per lb. Price per Flask.	42.00

Zinc—Duty, Sheet, 2c. per lb. 600-lb. casks, 8.00 per lb., open, 8.50 per lb.

Tobin Bronze—Rods, Unfinished, 19c.

Tobin Bronze—Rods, Finished, 20c.

PRICE FOR ALUMINUM BRONZE INGOTS.

	Per pound.
2½ per cent	19c.
5 per cent	19½c.
7½ per cent	20½c.
10 per cent	21½c.

Manganese Bronze, Ingots	16 to 17c.
Phosphor Bronze, Ingots	16 to 20c.
Silicon-Copper, Ingots	32 to 36c.

OLD METALS

	Buying.	Selling.
Heavy Cut Copper	13.25c.	13.50c.
Copper Wire	13.00c.	13.25c.
Light Copper	11.75c.	12.25c.
Heavy Mach. Comp.	11.25c.	11.50c.
Heavy Brass	8.25c.	8.50c.
Light Brass	7.00c.	7.25c.
No. 1 Yellow Brass Turnings	7.50c.	8.00c.
No. 1 Comp. Turnings	9.50c.	10.00c.
Heavy Lead	4.20c.	4.25c.
Zinc Scrap	4.40c.	4.60c.
Scrap Aluminum, sheet, pure	22.00c.	25.00c.
Scrap Aluminum, cast, alloyed	12.00c.	18.00c.
Old Nickel	15.00c.	25.00c.
No. 1 Pewter	20.00c.	21.00c.

PRICES OF SHEET COPPER

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 18¾ to 25 lb. sheet 30x60	16oz. to 24oz. 12½ to 18¾ lb. sheet 30x60	14oz. and 15oz. 11 to 12½ lb sheet 30x60
		CENTS PER POUND.					
Not wider than 30 ins.	Not longer than 72 ins.	19	19	19	19	19	20
	Longer than 72 ins. Not longer than 96 ins.	19	19	19	19	19	20
	Longer than 96 ins.	19	19	19	19	19	21
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	19	19	19	19	19	21
	Longer than 72 ins. Not longer than 96 ins.	19	19	19	19	19	21
	Longer than 96 ins. Not longer than 120 ins.	19	19	19	19	20	22
	Longer than 120 ins	19	19	19	20	21	
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	19	19	19	20	21	23
	Longer than 72 ins. Not longer than 96 ins.	19	19	19	20	22	24
	Longer than 96 ins. Not longer than 120 ins.	19	19	19	21	23	27
	Longer than 120 ins.	19	19	20	22	25	
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	19	19	19	20	22	25
	Longer than 72 ins. Not longer than 96 ins.	19	19	19	21	23	28
	Longer than 96 ins. Not longer than 120 ins.	19	19	20	22	25	
	Longer than 120 ins	20	20	21	23	27	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 ins.	19	19	20	22	27	
	Longer than 96 ins. Not longer than 120 ins.	19	19	21	24	29	
	Longer than 120 ins.	20	20	22	27		
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	20	20	22	25		
	Longer than 96 ins. Not longer than 120 ins.	21	21	23	26		
	Longer than 120 ins.	22	22	24	28		
Wider than 108 ins.	Not longer than 132 ins.	23	23	25			
	Longer than 132 ins.	24	24	27			

Rolled Round Copper, ⅜ inch diameter or over, 19 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)

Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.

All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.

All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.

Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.

Planished Copper, one (1) cent per pound more than Polished Copper.

Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.

Tinning Sheets, on one side, 2½c. per square foot.

For tinning both sides, double the above price.

For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, February 1, 1905

Net Cash Prices.

COPPER BOTTOMS, PITS AND FLATS.

14 oz. to square foot, and heavier, per lb..... 23c.
Lighter than 10 oz..... 29c.
10 oz. and up to 12 oz..... 26c.
12 oz. and up to 14 oz. to square foot, per lb..... 24c.
Circles less than 8 in. diam., 2c. per lb. additional.
Circles over 13 in. diam. are not classed as Copper Bottoms.
Polished Copper Bottoms and Flats, 1c. per lb. extra.

PRICE LIST FOR ROLL AND SHEET BRASS

Prices are for 100 lbs. or more of sheet metal in one order. Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and including	2 12	12 14	14 16	16 18	18 20	20 22	22 24	24 26	26 28	28 30
To No. 20 inclusive..	.22	.23	.25	.27	.29	.31	.33	.36	.39	.42
Nos. 21, 22 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26.....	.23	.24½	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28.....	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ½ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from List, 30 per cent.

PRICE LIST FOR BRASS AND COPPER WIRE

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass	Low Brass	Gilding Bronze and Copper
All Nos. to No. 10, inc.	$0.23	$0.27	$0.28
Above No. 10 to No. 15..	.23½	.27½	.28½
Nos. 17 and 18.....	.24	.28	.32
" 19 and 20.....	.25	.29	.33
No. 21.....	.26	.30	.34
" 22.....	.27	.31	.35
" 23.....	.28	.32	.36
" 24.....	.30	.34	.38

Discount, Brass Wire, 30 per cent.; Copper Wire, 35 per cent.

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ in. to 3½ in. O. D. Nos. 4 to 18 Stubs Gauge, 20c. per lb.
Seamless Copper Tubing, 23c. per lb.
For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb	28	27	22	21	20	20	21	20	20	20	20	21	22	24	26	27

BRAZED BRASS TUBING

Brown & Sharpe's Gauge the Standard.

Plain	Round	Tube,	¾	in.	up	to	2	in.,	to	No.	19,	inc.	Per lb $0 35
"	"	"	⅞	"	"		2½	"		"	19,	"	36
"	"	"	1	"	"		2½	"		"	19,	"	38
"	"	"	1⅛	"	"		2½	"		"	19,	"	41
"	"	"	1¼	"	"		2½	"		"	19,	"	48
"	"	"	1½	"	"		2½	"		"	19,	"	65
"	"	"	1¾	"	"		2½	"		"	19,	"	1 00
"	"	"	2	"	"		2½	"		"	19,	"	1 50

Smaller than ¾ inch.....Special
2 inch to 3 inch, to No. 19, inclusive..... 38
3 inch..... 40
Over 3 inch to 3½ inch..... 45
Over 3½ inch..... 50

Bronze and copper advance 3 cents. Discount 35 per cent.

PRICE LIST FOR SHEET ALUMINUM

PLATE AND SHEET PRICE LIST.—B. & S. GAUGE.

Prices are for 50 pounds or more at a time. Less quantities, 5 cents per pound additional. Charges made for boxing.

	Polishing One Side.	Sat. Fin. with-out Lacquer. One Side.	Satin Finish two sides double above prices.	Polished two sides double above prices.
No. 18 & heavier.	3	6	12	24
14	3	6	12	24
15	3	6	12	24
16	3	6	12	24
17	3	6	12	24
18	3	6	12	24
19	3	6	12	24
20	3	6	12	24
21	3	6	12	24
22	3	6	12	24
23	3	6	12	24
24	3	6	12	24
25	3	6	12	24
26	3	6	12	24
27	3	6	12	24
28	3	6	12	24
29 & 30	3	6	12	24
.005" to .0015"	3	6	12	24
Less than .0015"	3	6	12	24

Wider Than... And Including...	3 in. 12 in. in coils.	6 in. 14 in.	14 in. 16 in.	16 in. 18 in.	18 in. 20 in.	20 in. 24 in.	24 in. 30 in.	30 in. 36 in.	36 in. 40 in.	40 in. 45 in.	45 in. 50 in.	50 in. 55 in.	55 in. 60 in.
No. 18 & heavier.	.....	43	44	44	44	44	47	47	47	48	48	50	50
14	.....	43	44	44	44	44	47	47	47	48	48	50	50
15	.....	43	44	44	44	44	47	47	47	48	48	50	50
16	.....	43	44	44	44	44	47	47	47	48	48	50	50
17	.....	43	44	44	44	44	47	47	47	48	48	50	50
18	.....	43	44	44	44	44	47	47	47	48	48	50	50
19	.....	43	44	44	44	44	47	47	47	48	48	50	50
20	.....	43	44	44	44	44	47	47	47	48	48	50	50
21	48	46	46	46	46	46	49	50	50	51	51	53	53
22	48	46	46	46	46	46	49	50	50	51	51	53	53
23	48	46	46	46	46	46	49	50	50	51	51	53	53
24	48	46	46	46	46	46	49	50	50	51	51	53	53
25	48	46	46	46	46	46	49	50	50	51	51	53	53
26	48	46	46	46	46	46	49	50	50	51	51	53	53
27	48	47	47	47	47	47	49	51	51	51	51	53	54
28	48	47	47	47	47	47	49	51	51	51	51	53	54
29 & 30	48	47	47	47	47	47	49	51	51	51	51	53	54
.005" to .0015"	48	47	47	47	47	47	49	51	51	51	51	53	54
Less than .0015"	48	47	47	47	47	47	49	51	51	51	51	53	54

Wider Than... And Including...	55 in. 60 in.	60 in. 65 in.	65 in. 70 in.	70 in. 75 in.	75 in. 80 in.	80 in. 85 in.	85 in. 90 in.	90 in. 95 in.	95 in. 100 in.	100 in. 105 in.	105 in. 110 in.	110 in. 115 in.	115 in. 120 in.
No. 18 & heavier.	50	50	50	50	50	50	50	50	50	50	50	50	50
14	50	50	50	50	50	50	50	50	50	50	50	50	50
15	50	50	50	50	50	50	50	50	50	50	50	50	50
16	50	50	50	50	50	50	50	50	50	50	50	50	50
17	50	50	50	50	50	50	50	50	50	50	50	50	50
18	50	50	50	50	50	50	50	50	50	50	50	50	50
19	50	50	50	50	50	50	50	50	50	50	50	50	50
20	50	50	50	50	50	50	50	50	50	50	50	50	50
21	53	53	53	53	53	53	53	53	53	53	53	53	53
22	53	53	53	53	53	53	53	53	53	53	53	53	53
23	53	53	53	53	53	53	53	53	53	53	53	53	53
24	53	53	53	53	53	53	53	53	53	53	53	53	53
25	53	53	53	53	53	53	53	53	53	53	53	53	53
26	53	53	53	53	53	53	53	53	53	53	53	53	53
27	54	54	54	54	54	54	54	54	54	54	54	54	54
28	54	54	54	54	54	54	54	54	54	54	54	54	54
29 & 30	54	54	54	54	54	54	54	54	54	54	54	54	54
.005" to .0015"	54	54	54	54	54	54	54	54	54	54	54	54	54
Less than .0015"	54	54	54	54	54	54	54	54	54	54	54	54	54

A additional charge for slitting coiled sheet in widths less than 3 in. and flat rolled sheets in widths less than 6 in. All columns except the first are for Flat Rolled Sheets.

Discounts as follows are given for sheet orders over 200 pounds.

200 to 1,000 pounds.....10 per cent. off list.
1,000 to 2,000 " 10 per cent. and 2 " "
2,000 to 4,000 " 10 " " 3 " "
4,000 pounds and over 10 " " 5 " "

Sheets polished or satin-finished on both sides, double the price for one side.

Price Per Foot of Seamless Aluminum Tubing.

(CHARGES MADE FOR BOXING.)

THICKNESS OF WALL IN STUBS' GAUGE.

Outside Diameter in Inches.	No. 12.	No. 14.	No. 16.	No. 18.	No. 20.	No. 22.	No. 24.	Outside Diameter in Inches.
1-4.....	.....	.....	.....	10	9	8	7	1-4
5-16.....	.....	.....	.....	11	9	8	7	5-16
3-8.....	.....	.....	.....	12	9	8	7	.....3 8
1-2.....	.....	.....	17	14	11	9	8	..... 1 2
5-8.....	.....	.....	21	16	13	12	.....	 5-8
3-4.....	.....	.....	25	19	16	14	.....	 3-4
7-8.....	.....	.....	28	22	18	16	.....	..... 7 8
1.....	.....	.....	30	25	21	19	.....	.....1 00
1 1-4.....	.....	.....	36	30	25	.....	.....	.....1 1 4
1 1-2.....	.....	52	43	35	28	.....	.....	.....1 1-2
1 3-4.....	.....	60	50	41	33	.....	.....	..... 1 3 4
2.....	84	68	58	47	37	.....	.....	.....2 00

Discount 20 to 30 per cent.

ALUMINUM

Drawn Rod and Wire Price List.—B. & S. Gauge.

Diameter B.& S.G'ge.	0000 to No.10	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb	38	38½	38½	0 39	39½	0 40	40½	0 41	0 42	0 43	0 44	0 47	0 52

200 lbs. to 30,000 lbs., three cents off list.
30,000 lbs. and over, four cents off list.